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Abstract

**REVIEW OF RESEARCH AND DEVELOPMENT WORK
FOR THE DRAGON PROJECT**

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The uranium-thorium cycle in a large power reactor with carbon moderator is described briefly. In the Dragon reactor experiment, the core is small and it has been found desirable to employ two types of fuel arranged in two zones. One type consists of uranium-235, thorium-232 and carbon, in proportions that might be typical of the composition in a large power reactor: The other type of fuel contains uranium-235 and zirconium as monocarbides, and makes up about three quarters of the core. The main reactor physics features of this core arrangement are described.

The adoption of the purged fuel element in the Dragon reactor experiment has necessitated the development of special graphites.

The problems of obtaining the right physical characteristics in these graphites and the production difficulties are reviewed briefly. Although helium is used as a coolant, the presence of oxidising impurities leads to corrosion and mass transfer of the exposed graphite surfaces. The investigation of this phenomenon has been carried out in laboratory-scale experiments and also with out-of-pile and in-pile loops. A complementary programme of work on the purification of helium to remove the chemical impurities and entrained fission products has also been carried out on the laboratory scale and in a pilot plant.

The diffusion of fission products and their evolution from graphite/carbide fuels at high temperatures is one of the major problems in reactors of this type. A solution to the problem has been sought in the use of pyrocarbon and silicon carbide coated particles. Results of irradiation experiments with a variety of specimens of uranium/zirconium monocarbide and uranium/thorium dicarbide coated particle fuels are reviewed.

The production of coated particle fuel and its assembly into the Dragon reactor experiment fuel element is being carried out by the Project on the reactor site. An outline of the production procedure is given.